

9.4

Special Right Triangles

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Goals

- Find the side lengths of special right triangles.
- Use special right triangles to solve real-life problems.

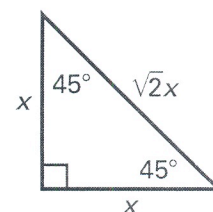
VOCABULARY

Special right triangles

THEOREM 9.8: 45°-45°-90° TRIANGLE THEOREM

In a 45°-45°-90° triangle, the hypotenuse is _____ times as long as each leg.

$$\text{Hypotenuse} = _____ \cdot \text{leg}$$

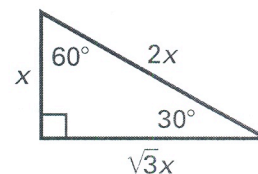


THEOREM 9.9: 30°-60°-90° TRIANGLE THEOREM

In a 30°-60°-90° triangle, the hypotenuse is twice as long as the _____ leg, and the longer leg is _____ times as long as the shorter leg.

$$\text{Hypotenuse} = 2 \cdot _____ \text{ leg}$$

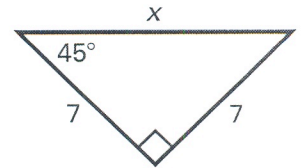
$$\text{Longer leg} = _____ \cdot \text{shorter leg}$$



Example 1 Finding the Hypotenuse in a 45° - 45° - 90° Triangle

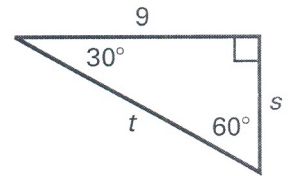
Find the value of x .

By the Triangle Sum Theorem, the measure of the third angle is $\underline{\hspace{1cm}}^\circ$. The triangle is a $\underline{\hspace{1cm}}^\circ$ - $\underline{\hspace{1cm}}^\circ$ - 90° right triangle, so the length x of the hypotenuse is $\underline{\hspace{1cm}}$ times the length of a leg.

**Example 2** Side Lengths in a 30° - 60° - 90° Triangle

Find the values of s and t .

Because the triangle is a 30° - 60° - 90° triangle, the longer leg is $\underline{\hspace{1cm}}$ times the length of the shorter leg.

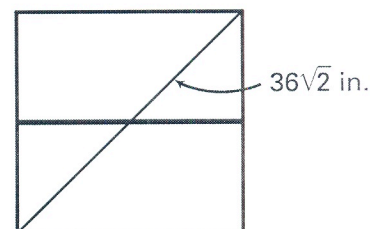


Checkpoint Find the values of the variables.

<p>1.</p>	<p>2.</p>	<p>3.</p>
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Example 3 Finding the Area of a Window

Construction The window is a square. Find the area of the window.



Solution

First find the side length s of the window by dividing it into two $\underline{\hspace{1cm}}^\circ$ - $\underline{\hspace{1cm}}^\circ$ - 90° triangles. The length of the hypotenuse is $\underline{\hspace{1cm}}$ inches. Use this length to find s .

$$\underline{\hspace{1cm}} = \underline{\hspace{1cm}} \cdot s \quad \underline{\hspace{1cm}}^\circ\text{-}\underline{\hspace{1cm}}^\circ\text{-}90^\circ \text{ Triangle Theorem}$$

$$\underline{\hspace{1cm}} = s \quad \text{Divide each side by } \underline{\hspace{1cm}}.$$

Use $s = \underline{\hspace{1cm}}$ to find the area of the window.

$$A = s^2 \quad \text{Area of a square}$$

$$= \underline{\hspace{1cm}}^2 \quad \text{Substitute.}$$

$$= \underline{\hspace{1cm}} \quad \text{Multiply.}$$

Answer The area of the window is $\underline{\hspace{1cm}}$ square inches.

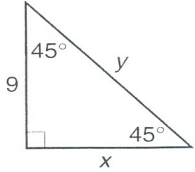
Skills Practice

9.4 Blue

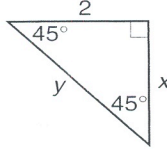
45°-45°-90° Triangles

Find the missing measures. Write all radicals in simplest form.

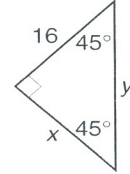
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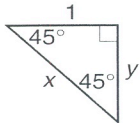
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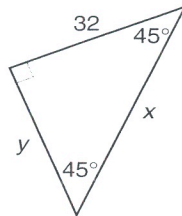
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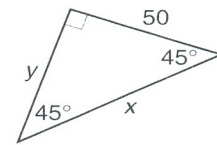
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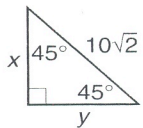
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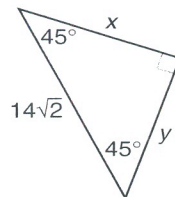
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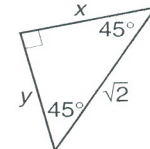
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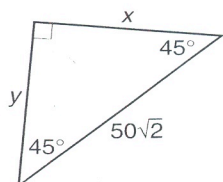
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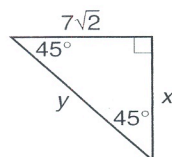
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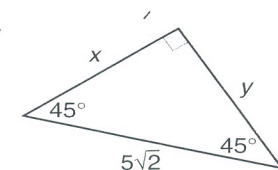
10.



11.



12.



Skills Practice

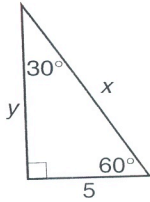
q. 4 blue

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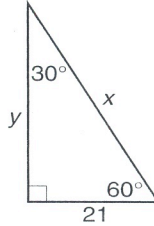
30°-60°-90° Triangles

Find the missing measures. Write all radicals in simplest form.

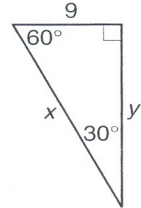
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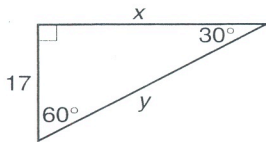
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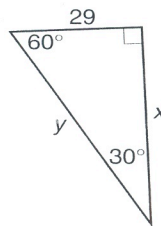
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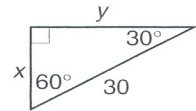
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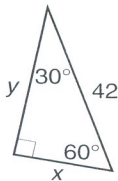
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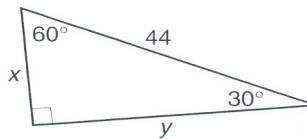
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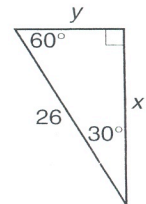
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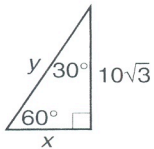
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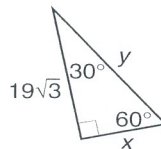
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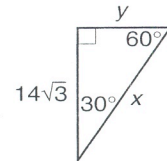
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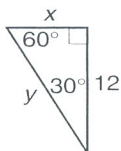
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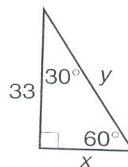
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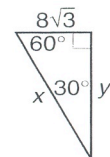
13.



14.



15.

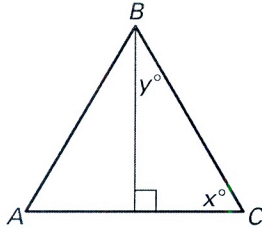


Practice A

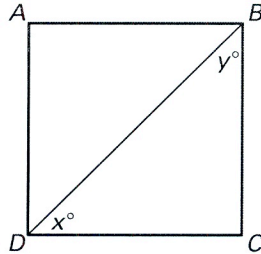
For use with pages 551–557

Find the value of each variable in the polygon.

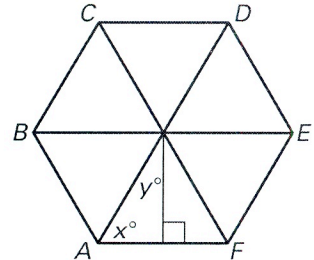
1. Equilateral $\triangle ABC$



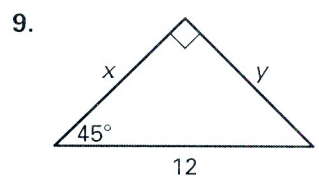
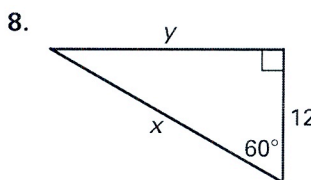
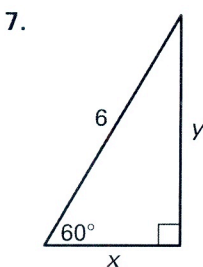
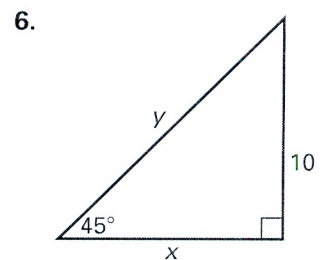
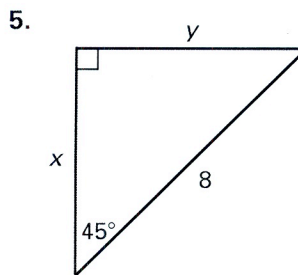
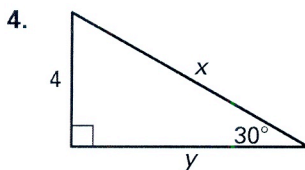
2. Square $ABCD$



3. Regular hexagon $ABCDEF$



Find the value of each variable. Write answers in simplest radical form.



Sketch the figure that is described. Find the requested length. Round decimals to the nearest tenth.

10. The side length of an equilateral triangle is 20 centimeters. Find the length of an altitude of the triangle.
11. The perimeter of a square is 20 centimeters. Find the length of a diagonal.
12. The diagonal of a square is 10 inches. Find the length of a side.

Baseball In Exercises 13–15, use the diagram and the following information.

The infield of a baseball field is a square. The distance from home plate to first base is 90 feet.

13. What is the distance from home plate to second base?
14. What is the distance from third base to first base?
15. If the pitcher's mound is 60 feet 6 inches from home plate, is it the midpoint of the diagonal from home plate to second base?

